

A First Response Crew Mask for Ammonia, Hydrazine and Combustion Products, Phase I

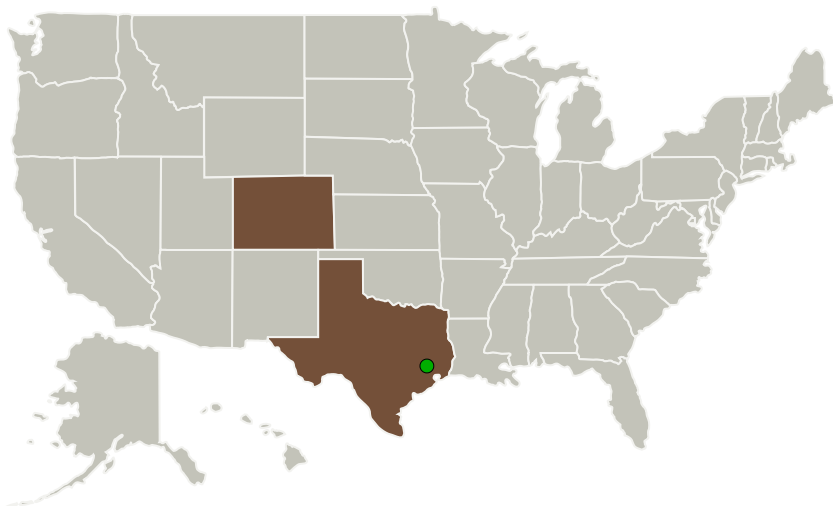
Completed Technology Project (2013 - 2013)



Project Introduction

The increasing frequency of International Space Station (ISS) egress operations results in chemical contamination of the spacecraft environment. Among the most important contaminants are propellant residues (such as hydrazine) and their decomposition by-products, as well as coolants such as ammonia and Freon. Ammonia has a 24 hour Spacecraft Maximum Allowable Concentration (SMAC) of 7 ppm (Perry, 2010) and hydrazine has a 24 hour SMAC of 0.3 ppm (NASA/JSC 20584, March, 2001). These highly alkaline chemicals rapidly penetrate skin and coagulate proteins. Furthermore, a hydrazine fuel leak onto any hot surfaces may cause fire. TDA Research Inc. proposes to develop a new adsorbent that can remove these contaminants to sub ppmv concentrations. In the Phase I, we will develop the adsorbent media and design a cartridge that will be incorporated into a first response crew mask. We will demonstrate the efficacy of the cartridge in removing these contaminants at full-scale in an environmental chamber (TRL 4). We will also complete the detailed design of a general purpose first response mask, including additional adsorbents and ambient temperature oxidation catalyst that will provide complete protection against all contaminants (in addition to NH₃ and hydrazine, CO, volatile organic compounds and combustion by-products, such as sulfur oxides will all be removed). In Phase II, we will work with Gentex, a leading supplier of personal protection systems in fabricating the mask and cartridges. We will complete high fidelity demonstrations in an environmental chamber to fully demonstrate its capability (non-human testing at TRL 6).

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
TDA Research, Inc.	Lead Organization	Industry	Wheat Ridge, Colorado
● Johnson Space Center(JSC)	Supporting Organization	NASA Center	Houston, Texas

Primary U.S. Work Locations	
Colorado	Texas

Project Transitions

 **May 2013:** Project Start

 **November 2013:** Closed out

Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/140396>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

TDA Research, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Gokhan Alptekin

Co-Investigator:

Gokhan O Alptekin

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Images



International Space Station (ISS) escape respirator cartridge with TDA's ambient temperature CO oxidation catalyst

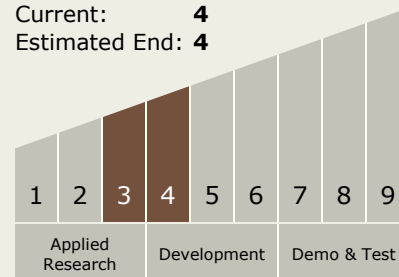
Project Image

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(<https://techport.nasa.gov/image/134473>)

Technology Maturity (TRL)

Start: **3**
Current: **4**
Estimated End: **4**



Technology Areas

Primary:

- TX06 Human Health, Life Support, and Habitation Systems
 - └ TX06.4 Environmental Monitoring, Safety, and Emergency Response
 - └ TX06.4.2 Fire: Detection, Suppression, and Recovery

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System